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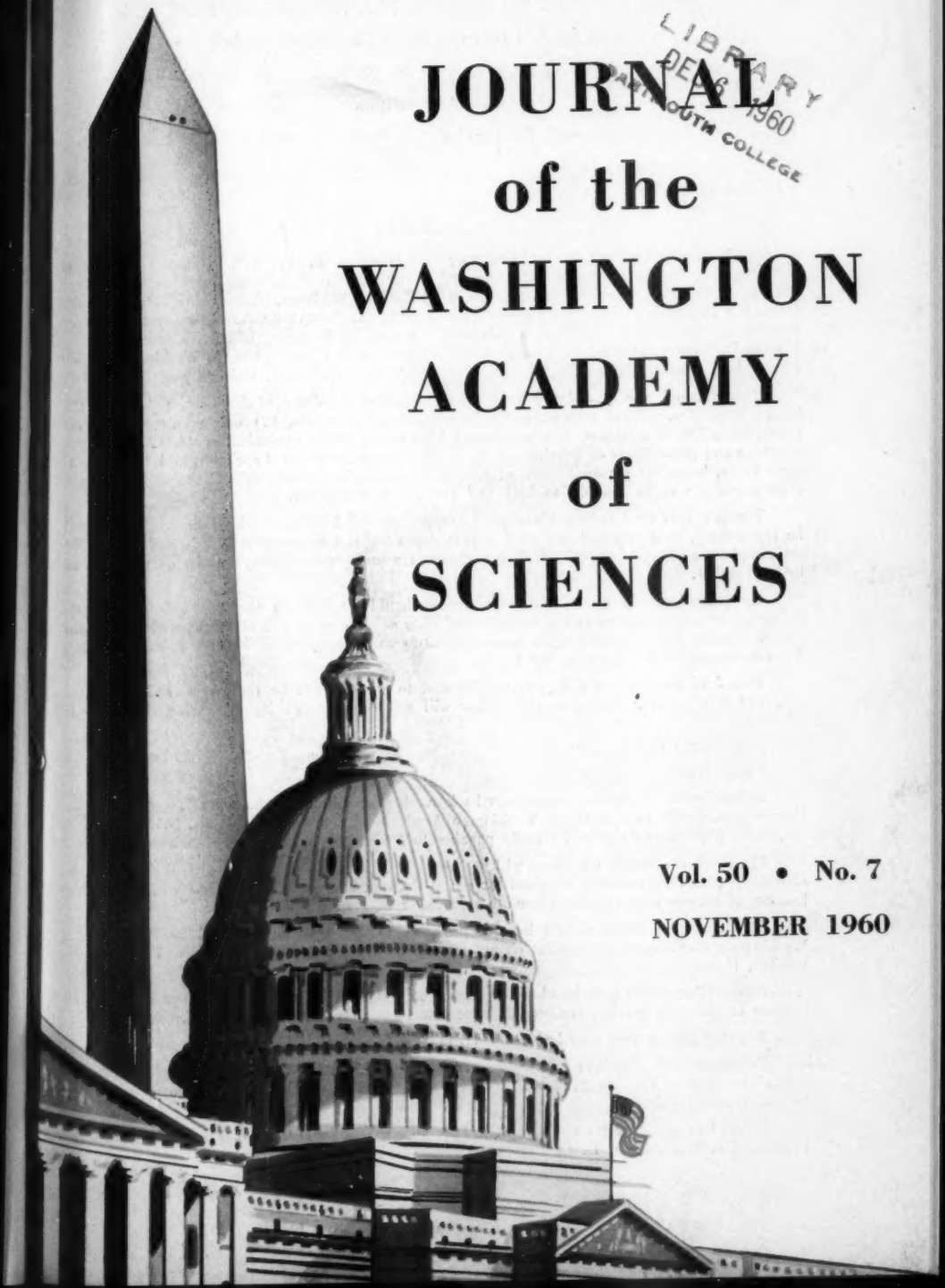

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Proceedings of the Geological Society of Washington

794th Meeting

The 794th meeting of the Society was held in the John Wesley Powell Auditorium, January 14, 1959, President Joseph W. Greig presiding.

Program—DEAN S. CARDER: March 5-7, 1958 eruptions of Manam Volcano off the north coast of New Guinea. See published abstract in Geol. Soc. Amer. Bull., v. 70, no. 12, p. 1711, 1959.

WALLACE DE WITT, JR. and G. W. COLTON: Stratigraphy of the Upper Devonian rocks in the Finger Lakes District of New York. See published abstract in Geol. Soc. Amer. Bull., v. 70, no. 12, p. 1761, 1959.

GEORGE W. COLTON: Sedimentary structures in some Upper Devonian rocks in western New York. See published abstract in Geol. Soc. Amer. Bull., v. 70, no. 12, p. 1759, 1959.

795th Meeting

The 795th meeting of the Society was held in the John Wesley Powell Auditorium, January 28, 1959, President Joseph W. Greig presiding.

Program—MARTIN F. KANE: Gravity study of the Rowe-Mora Basin, New Mexico.

A regional gravity survey of the Rowe-Mora area in northeastern New Mexico was made in May, 1957. The area surveyed is bounded by the Rio Grande on the west, extends to Raton on the north, to Logan and Gladstone on the east, and to Vaughn and Fort Sumner on the south. Most of the gravity anomalies that were outlined by the survey seem to be caused by density changes within the Precambrian basement rocks. A few of the anomalies are probably related to relief on the surface of the basement.

A gravity anomaly of -50 milligals is present in the Sangre de Cristo Mountains which occupy the western part of the area. The anomaly may be caused by a granitic core underlying the mountains, a thick section of clastic sedimentary rocks of Pennsylvanian age, or a thick wedge of younger and less dense sedimentary rocks presumably overlain by the Precambrian and Pennsylvanian thrust sheets exposed at the surface. Calculations indicate that the maximum depth to the mass deficiency is less than 15 kilometers, thus seeming to rule out a subcrustal root as the source.

In the plains-plateau area to the east, a positive gravity nose indicates the presence of dense basement rock, probably a mafic intrusive, which may mark an extension of the Wichita uplift of Oklahoma and Texas. A gravity low is present over the Sierra Grande uplift indicating that the rock forming the uplift has a relatively low density. The rock is probably felsic, a conclusion that is supported by the available drill-hole data. In the area around Las Vegas and Santa Rosa the gravity anomalies seem to be related to relief of the basement.

North of the town of Wagon Mound, both aeromagnetic and gravity data indicate the presence of a deep sedimentary basin, probably bounded on the east and south by faults.

EUGENE S. SIMPSON: A ground water mechanism for the deposition of glacial till.

An hypothesis is presented to explain erosion, deposition, and compaction of till by continental glaciers in temperate regions. Except for a relatively narrow zone at the periphery and at the surface of a continental glacier, ice is at the pressure-melting temperature and meltwater is produced by heat flow due to thermal gradients. Near the periphery meltwater escapes as fast as produced. This together with reduced ice pressure

(because of thinning) results in "cold" ice, i.e., ice whose temperature is below the pressure-melting point. This ice erodes, incorporates, crushes, and mixes rock debris. However, average ice velocity is greater than ice velocity near the base, and debris lags farther and farther behind the glacial toe. Eventually, debris is in a zone where ice is at the pressure-melting temperature and where meltwater is accumulating. This ice has no shear strength and consequently the incorporated debris is deposited. Meltwater escaping from the ice and moving down through the debris into the subjacent rock aquifer (from whence it discharges outward toward the toe) causes compaction.

GERMAINE A. JOPLIN: The origin of the calc-alkaline rocks.

796th Meeting

The 796th meeting of the Society was held in the John Wesley Powell Auditorium, February 11, 1959, President Joseph W. Greig presiding.

Program—T. C. HOERING and P. L. PARKER: Abundance of chlorine isotopes in nature.

A procedure for measuring small differences in the Cl^{37}—Cl^{35} ratio was developed. It consisted of transforming precipitates of silver chloride quantitatively to hydrogen chloride gas and the measurement of the isotope ratio in the mass spectrometer. This technique was applied to a large number of chlorine samples from a wide variety of geological origins. No detectable difference in the chlorine isotope ratio was found. These observations are discussed in terms of the reactions in the geochemical cycle of chlorine. Since the geochemistry of chlorine is that of a chloride ion, few chances for isotope fractionation in equilibrium and kinetic processes exist. In the few cases where an isotope fractionation may exist, the temperature was high enough to make the effect small.

ROBERT B. NEUMAN: Sedimentation in the Ocoee series, Great Smoky Mountains.

Detritus derived from both eastern and western quadrants can be inferred from stratigraphy and sedimentary structures of the Ocoee series (late Precambrian) in western North Carolina and eastern Tennessee. The lowest part, the Snowbird group, has coarse-grained sandstone at its base that grades upward through quartzite and silty sandstone to siltstone. This sequence records a transgression toward the southeast, confirmed by crossbedding in the quartzite that indicates currents moving westward.

Rocks overlying the Snowbird form two contrasting sequences: on the southeast the Great Smoky group (and three formations not assigned to groups) is characterized by feldspathic sandstones with pronounced graded bedding; to the northwest the Walden Creek group is dominantly siltstone with lenses of coarse sandstone and pebble conglomerate. Transportation and deposition of sandstones of the southeastern sequence was probably largely by turbidity currents. Furrows at the base of some sandstone beds have a NW-SE orientation, indicating that currents came from one or the other of these directions. That these currents came from the southeast is suggested by the contrasting composition of the Walden Creek group for which a northwesterly source is inferred. The northwestern source of detritus persisted in the Appalachians through Early Ordovician time.

STANISLAW DZULYNSKI: Evolution of the Carpathian Geosyncline during the Oligocene. See published abstract in Geol. Soc. Amer. Bull., v. 69, no. 12, p. 1556, 1958.

797th Meeting

The 797th meeting of the Society was held in the John Wesley Powell Auditorium, February 25, 1959, President Joseph W. Greig presiding.

Informal communication—HENRY FAUL: On carbonitites and other, seemingly related, subjects.

Program—W. GARY ERNST: Glauco-

phane stability and the glaucophane schist problem.

Glaucophane, $Na_2Mg_3Al_2Si_8O_{22}(OH)_2$, has been hydrothermally synthesized and its stability field determined up to 2000 bars vapor pressure. The experimental investigation shows that high pressure is not required for the stable existence of glaucophane.

Consideration of laboratory and field evidence leads to the conclusion that glaucophane schists can form under a variety of conditions.

(a) Since glaucophane is not a high-pressure mineral, it may occur over a wide P-T range in rocks of unusual chemistry; bulk compositions (rock + pore fluid) deficient in CaO, and rich in Na_2O (and MgO + FeO) relative to Al_2O_3 would favor the development of glaucophane. Moreover, bulk compositions with soda in excess of alumina would promote crystallization of intermediate members of the glaucophane-riebeckite series.

(b) Those alkali amphibole-bearing schists which are compositionally identical to greenschists and epidote amphibolites must belong to a separate metamorphic facies. Since reactions involved in converting greenschists and epidote amphibolites into glaucophane schists are favored by elevated pressures (or diminished temperatures), the glaucophane schist facies represents a relatively high pressure (or low temperature) equivalent of these two more common facies. The glaucophane schist facies may be defined by the diagnostic assemblages (1) glaucophane + calcium-aluminum-silicate, (2) glaucophane + white mica, and (3) jadeite + quartz. Assemblage (1) occurs in rocks of roughly basaltic composition; assemblage (2) is typical of aluminous bulk compositions; and assemblage (3) is obtained in rocks relatively enriched in Na_2O.

E-AN ZEN: Mineral assemblages in slate in western Vermont.

JOHN C. REED, JR. and BRUCE H. BRYANT: Lower Cambrian and Late Precambrian rocks in the Grandfather Mountain window, North Carolina.

Sedimentary and volcanic rocks of low metamorphic grade in the Grandfather Mountain area, well within the Blue Ridge province of western North Carolina, were recognized by Arthur Keith during his survey of the Cranberry, Morganton, and Mt. Mitchell quadrangles in the 1890's. He correlated these rocks with the Chilhowee group of the Valley and Ridge province to the west, and believed they occurred in a complex syncline in the crystalline rocks of the Blue Ridge province. Subsequent workers have suggested that these rocks are exposed in a window beneath a major overthrust along which early Precambrian gneisses, schists, and granites of the Blue Ridge have been carried many miles northwestward. This later interpretation has been confirmed by recent detailed mapping in the Linville and Table Rock quadrangles.

All sedimentary rocks within the Grandfather Mountain window have been progressively metamorphosed to a grade at which albite and sericite have developed. New biotite has formed in rocks of appropriate composition. Basement rocks within the window have been retrogressively metamorphosed to a similar grade. In the coarse-grained clastic rocks, sedimentary textures and structures are well preserved; in the fine-grained rocks, clastic original textures have been destroyed by recrystallization.

Two structurally separate sequences of sedimentary rocks are present in the western part of the window: an autochthonous sequence which rests unconformably on a basement of cataclastic granitic gneisses and phyllonites; and an allochthonous sequence which occurs in a thrust sheet that has overridden the autochthonous rocks and has in turn been overridden by the Precambrian rocks in the main overthrust sheet west of the window.

Arkose overlain by phyllite forms a thick basal unit of the autochthonous sequence. In the west-central part of the

window, arkose also overlies the phyllite of the basal unit, but to the south the upper arkose appears to finger out into phyllite. In the upper part of the autochthonous section is a widespread unit of amygdaloidal greenschist derived from basaltic flows (Montezuma schist).

The arkose of the autochthonous sequence is coarse- to fine-grained and contains minor interbeds of light-gray to green sericite phyllite. The lower part of the basal arkose member is generally fine-grained; the upper part of the member contains very coarse-grained units in which individual feldspar clasts reach more than one centimeter in diameter. Conglomerates are most common in the upper part of the basal arkose; they occur as channel fillings and contain quartz, arkose, phyllite, rhyolite, and granitic pebbles. A local conglomerate consists only of rhyolite cobbles.

The large feldspar clasts in the arkoses are predominantly microcline. Plagioclase, in subordinate amounts, occurs in small grains, most of which retain their clastic shapes. Quartz has been recrystallized except for some large clastic grains. Chlorite and biotite are absent, but the rock contains abundant green iron-rich sericite. The heavy mineral suite in the arkose consists of abundant zircon, magnetite, and leucoxene. Tourmaline is rare.

Dark biotite phyllite and phyllitic siltstone comprise the bulk of the phyllitic portion of the autochthonous sequence. Locally, thin beds of calcareous phyllite and rare lenses of sandy marble are present. The uppermost beds exposed adjacent to the window boundary in the Linville quadrangle are metagraywackes and conglomeratic metagraywacke containing abundant pebbles of andesite, phyllite, arkose, granitic rocks, and occasional pebbles of limestone and rhyolite. Typically, the phyllite contains biotite and chlorite in addition to sericite. The proportion of feldspar is quite variable, but plagioclase is predominant.

Structural complexity has precluded an accurate estimate of the stratigraphic thickness of these units, but the total may be as much as 50,000 feet.

The allochthonous sequence differs from the autochthonous sedimentary sequence in lithology, is more uniform stratigraphically, and is structurally simpler. The lowest unit of the allochthonous sequence consists of well-bedded sericitic arkose, arkosic quartzite, and some clean quartzite with much interlayered dark-green and gray sericite phyllite. This unit is at least a thousand feet thick, but its total thickness is unknown because of its position in the thrust sheet.

Overlying this unit is 30 to 100 feet of steel-blue to dark-gray lustrous phyllite which passes upward into thick-bedded to massive white sugary quartzite and arkosic quartzite, commonly with minor interbeds of blue phyllite. The upper quartzite unit is approximately 800 feet thick.

Near the western edge of the window, massive blue-gray dolomite conformably overlies the upper quartzite. This unit is almost certainly the equivalent of the Lower Cambrian Shady dolomite of the Valley and Ridge province.

In general, rocks of the allochthonous sequence contain less feldspar than the arkoses of the autochthonous sequence. Texturally, however, rocks of comparable grain size in the two sequences are quite similar. Green sericite is abundant, especially in the lower part of the allochthonous rocks. Biotite and chlorite are absent in the phyllites of this sequence, apparently because the original composition was inappropriate. The heavy mineral suite from the allochthonous sequence is characterized by abundant tourmaline, together with zircon, magnetite, and leucoxene.

No fossils have been found in any of the rocks of the Grandfather Mountain window. The lithology and stratigraphic position of the rocks of the allochthonous sequence beneath the Shady dolomite strongly suggest that these beds are part of the Lower Cambrian and late Precambrian (?) Chilhowee group, presumably representing the Erwin and Hampton formations and, perhaps, parts of the

Unicoi formation. Correlation of the autochthonous sediments is less certain. Lithologically and stratigraphically they differ strikingly from any Chilhowee or younger deposits in the Valley and Ridge province. They are probably pre-Chilhowee, and possibly represent a transitional facies between the nonvolcanic clastic rocks of the Ocoee series to the west and the volcanic rocks of the Mount Rodgers volcanic group to the north, both of which underlie the Chilhowee group. They may, of course, represent an isolated deposit of pre-Chilhowee age for which no correlatives have been recognized.

798th Meeting

The 798th meeting of the Society was held in the John Wesley Powell Auditorium, March 11, 1959, President Joseph W. Greig presiding.

Program—EMILY JAGER: Age measurements on some Alpine and pre-Alpine micas. See note published in Geol. Soc. Amer. Bull., v. 70, no. 12, p. 1553-1557, 1959.

WILLIAM BACK: Calcium carbonate saturation in ground water.

HELEN FOSTER: Mt. Fuji, Japan, and its deposits of volcanic ash.

799th Meeting

The 799th meeting of the Society was held in the John Wesley Powell Auditorium, March 25, 1959, President Joseph W. Greig presiding.

Program—ROBERT B. GUILLOU: Project ARMS (Aerial Radiological Monitoring Surveys)—an important contribution to geology.

The U.S. Geological Survey, on behalf of the U.S. Atomic Energy Commission began a nationwide program of aerial radiological monitoring surveys (Project ARMS) in July, 1958. The purpose of the program is to obtain data which can be used to appraise changes in environmental levels of radiation brought about by nuclear testing programs, operation of reactors and other nuclear facilities, and radiation accidents. At first, most of the ARMS work will consist of surveys of reactor and major production facilities, including the area extending out about 50 miles from the center of each facility. The airborne surveys are flown 500 feet above the ground along parallel flight lines oriented normal to regional geologic trends and spaced one or two miles apart. In addition to aeroradioactivity data, aeromagnetic data are being recorded on all surveys.

ARMS projects scheduled at present include: Savannah River Plant, Georgia Nuclear Aircraft Laboratory, Oak Ridge, New England, Pittsburgh, Chicago, Fort Worth, Los Angeles, San Francisco, Hanford, Idaho Falls, and Nevada Test Site. Reports submitted to the AEC on each area will include aeroradioactivity data and a correlation of aeroradioactivity data, geology, and pedology.

Aeroradioactivity and aeromagnetic data are expected to make a significant contribution to knowledge of the geology of each area surveyed. Work to date indicates that both types of data are extremely useful in mapping and understanding the geology of the Piedmont and other areas of complex geology. In sedimentary terrane, the interpretation of aeromagnetic data can yield information on basement structure while information on the distribution of surficial material is obtained from the radioactivity data.

PAUL BARTON and P. M. BETHKE: Distribution of minor elements between coexisting sulfides.

ROBERT S. SIGAFOOS: Botanical evidence of floods and flood-plain deposition.

800th Meeting

The 800th meeting of the Society was held in the John Wesley Powell Auditorium, April 8, 1959, President Joseph W. Greig presiding.

Program—HUGH D. MISER: Our Society—retrospect and prophecy.

SIDNEY P. CLARK, JR.: Estimates of temperature in the outer mantle.

T. C. PHEMISTER: Nature of the contact of Temiskaming and Grenville geological provinces in northern Ontario.

801st Meeting

The 801st meeting of the Society was held in the John Wesley Powell Auditorium, April 22, 1959, President Joseph W. Greig presiding.

Program—ALAN E. PECKHAM: preliminary investigations of underground waste disposal near Arco, Idaho.

Since 1954 the U.S. Geological Survey, in cooperation with the U.S. Atomic Energy Commission, has been studying the direction, rate of movement, and the dispersion of saline-water effluent discharged from the Chemical Processing Plant (CPP) to the underlying basalt aquifer through a disposal well at the National Reactor Testing Station (NRTS), Idaho. The effluent averages about 250 ppm in chloride concentration, whereas natural waters in this area normally have chloride concentrations of less than 20 ppm.

Earlier studies indicate that the regional ground-water flow is from northeast to southwest. Detailed interpretation of the movement is made difficult by local variations in permeability, the effects of intermittent recharge from the Big Lost River, and intermittent pumping of the CPP production wells, combined with the dynamics of the disposal well and the aquifer itself.

Chloride concentrations of more than 150 ppm have been detected in 3 test wells near the disposal well, and 2 other wells have yielded water containing about 100 ppm of chloride. Six more distant test wells have yielded water having chloride concentrations as much as 3 times that normally expected in water from this area. The significance of these data is difficult to establish.

The lag in time between changes in plant discharge through the disposal well and changes in chloride concentrations in test wells indicates straight-line average rates of ground-water movement of 15 to 50 feet per day, from the disposal well to "intercept" wells south and west of the disposal well. The effluent moves radially from the disposal well in one or more permeable zones for some distances (perhaps 1,000 feet) before the flow lines trend directly down the regional ground-water gradient. This is just the reverse situation of the lines of flow into a pumped well in a region in which ground water has a constant motion in a general direction, as described by C. S. Slichter in the 19th Annual Report, part II, of the U.S. Geological Survey.

It is hoped that future tracer tests and other studies, supported by some additional test wells, will yield more accurate knowledge of the geologic and hydrologic character of the aquifer, and will facilitate operation of AEC's Chemical Processing Plant.

BRIAN SKINNER: System ZnS-MnS-FeS; effects of maganese on the sphalerite geothermometer.

WILLIAM A. OLIVER, JR. and ALONZO W. QUINN: Geology of the Narragansett Basin, Rhode Island and Massachusetts.

Several areas, in all of the New England states except Vermont, have been mapped at one time or another as containing Carboniferous sedimentary or metasedimentary rocks. The 1932 Geologic Map of the United States shows 5 major and several minor basins, extending from the south shore of Rhode Island to Bath, Maine. The age of most of these basins is in question, but the southernmost one, the Narragansett basin, is dated as Pennsylvania (probably Allegheny age) by an abundance of plant fossils.

The Narragansett basin covers a 55 by 25 mile area in eastern Rhode Island and Massachusetts. The sedimentary rocks in the basin are less resistant to erosion than surrounding, older rocks, and the basin is a partially drowned, heavily glaciated, lowland margined by a crystalline escarpment.

Within the basin, the basal Pondville conglomerate is overlain to the north by red shale, sandstone and conglomerate of the Wamsutta formation, 1000 to 2000 feet thick. The thickest and most

widespread unit is the Rhode Island formation which overlies and interfingers with the Wamsutta formation to the north, but rests on the Pondville conglomerate or the older crystalline rocks to the south. The Rhode Island formation consists of some 10,000 feet of grey and black shale, sandstone, and conglomerate with several intercalated coal beds. The youngest formation in the northern part of the basin is the Dighton conglomerate, preserved in the troughs of several synclines. To the south, the Purgatory conglomerate may be of the same age or may represent one or more conglomerate units within the Rhode Island formation.

Plant fossils are common in the black shales and have been found in the sandstone and red shale. Well over 100 species of ferns, seed ferns, arthrophytes, lepidophytes and miscellaneous plants have been described or listed from the Rhode Island formation. A few species are known from one or two localities in the Wamsutta formation. Animal fossils, all from the Rhode Island formation, consist of some 14 insects (mostly cockroaches), 1 arachnid, 12 to 15 fresh water pelecypods, and a few worm tubes. Locally common are 4 species of conchostracans.

The Pennsylvanian rocks of the Narragansett basin rest uncomforably on, and are downfaulted against, older Paleozoic and Precambrian (?) crystalline rocks. Numerous faults and folds lie within, as well as along, the margins of the basin. In the southern part of the basin, small folds with axial plane cleavage are abundant and there appears to be at least one major overturned anticline. Stretched pebbles reflect increasing structural complexity toward the south. Northeast of Providence, pebbles in the sedimentary rocks are apparently undistorted; just south of Providence they are 2 to 3 times as long as they are wide; and in the southwest corner of the basin a length-width ratio of 13:1 has been reported. Wherever determinable, the long axes of the pebbles lie in the plane of the bedding and parallel to the axes of associated north trending folds. Southwestward increases in metamorphic grade of the rocks, and in coal rank, are also noted.

The shape and extent of the Narragansett basin in Pennsylvanian time is unknown, but the abundance of coarse conglomerate throughout the section seems to indicate considerable surrounding relief and the area probably consisted of one or more intermontaine basins. Portions of the basal conglomerate were locally derived, but the bulk of the sediments in all formations were transported some distance by streams. The sandstones and conglomerates have the characteristic, irregular cross-bedding and cut-and-fill features of stream deposits. The finer sediments were deposited on the flood plains, and at one time or another coal swamps covered much of the basin. There is no indication of any marine connection at any time. A northern source for most of the sediment is indicated by (1) sedimentary structures, (2) an increase in quartz content of sediments to the south, and (3) the red to gray-black facies change.

The red color of the Wamsutta formation is due to the preservation of red iron pigment which was brought in during sedimentation. The area of deposition of this sediment was apparently slightly higher and better drained so that the red color could be preserved. To the south, lower gradients with poorer drainage produced conditions under which the iron-oxide was reduced so that grays and blacks predominate. Later deposits over the whole basin are predominately gray sandstones and conglomerates with only minor amounts of shale. Evidently the area continued to be mountainous throughout the period of deposition.

The Narragansett basin is the only Pennsylvanian coal basin of its kind in North America, but it is strikingly similar in its characteristics and history to the limnic coal basins of France and adjacent countries. The Narragansett basin and the limnic basins of Europe were intermontaine basins that received great thick-

nesses of non-marine sedimentary rocks which were deposited in complete isolation from the sea and from areas of alternately marine and non-marine deposition. They have comparatively few, but thick, coal beds and exhibit rather complex, commonly metamorphic structures dating from late phases of the orogenic movement which produced the intermontaine basins in the first place.

802nd Meeting

The 802nd meeting of the Society was held in the John Wesley Powell Auditorium, October 14, 1959, President Joseph W. Greig presiding.

Program — HARRY W. SMEDES: Structural interpretation of western Montana and northern Idaho.

An east-trending trough in western Montana marks a major crustal block which has affected sedimentation since Precambrian Belt time and has influenced Laramide deformation. Between Helena and Missoula, the trough is characterized by infolded Belt rocks and younger strata and is bounded by Belt strata to the north and pre-Belt crystalline rocks to the south. The Boulder and Philipsburg batholiths and an eastern salient of the Idaho batholith are restricted to the area of this block. The northern boundary, marked by en echelon folds and east-west thrusts, lies on strike with the straight northern edge of the Idaho batholith. Thrust belts east of the Boulder batholith and near the Philipsburg batholith bulge eastward within the trough. A wedge pattern of northwesterly trending faults in Idaho forms an apparent apex near Missoula. Displacement along some of these faults such as the Osburn fault, is right lateral.

These structural elements can be integrated by the following kinematic interpretation. During the Laramide orogeny, the supracrustal rocks of the trough (and perhaps the crustal block itself) moved eastward and produced: (1) a left-lateral tear zone along the northern border, marked by en echelon folds and thrusts which may have localized the northern contacts of the batholith; and (2) eastward deflections of the Lewis-Lombard and Philipsburg fold and thrust belts. Right-lateral faults branched from the tear zone near Missoula to form a composite wedge that moved relatively westward, as though pinched between the trough rocks and those to the north.

L. T. ALDRICH: Mineral ages in the metamorphic rocks of Iron and Dickinson Counties, Michigan.

Thirty-five independent mineral ages of micas suggest the following sequence of events: Basement gneisses formed and basal member of Dickinson series laid down before 2000 m.y. ago; metamorphic events at 2000 m.y.; pegmatite intrusion at 1800 m.y.; metamorphism at 1650 m.y.; and granite intrusion and metamorphism at 1400 m.y. The 1650 m.y. event may be the result of the super-position of the 1800 and 1400 m.y. events.

MARIAN KSIAZKIEWICZ: Sedimentation and tectonics in the Carpathians. See published paper in Geol. Soc. Amer. Bull., v. 70, no. 8, p. 1089-1118, 1959.

803rd Meeting

The 803rd meeting of the Society was held in the John Wesley Powell Auditorium, October 28, 1959, President Joseph W. Greig presiding.

Program — ALLISON R. PALMER: Early Late Cambrian stratigraphy of the United States.

Sedimentation during the early late Cambrian seems to have been in three generally contrasting belts approximately parralleling the shoreline. The inner and outer belts are characterized by considerable amounts of argillaceous and arenaceous materials. The middle belt is characterized by oolitic, echinodermal, algal, sublithographic, banded or mottled, and generally clean carbonate rocks. In addition, sediments in the inner belt are often glauconitic. Limestones included in the inner belt are generally muddy, whereas those in the outer belt are generally silty. Fine suspended material, in the liquid resulting from solution of limestones from

these belts in acid, is generally brown, yellow or orange for limestones from the inner belt, and black for limestones from the outer belt.

The general early late Cambrian sedimentary history indicates lateral movement of the sedimentary belts toward the continental shoreline during the early and later parts of this time. A short-lived, but widespread, movement of the sedimentary belts away from the shoreline took place between the times represented by the beginning of the *Aphelaspis* zone and the end of the *Dunderbergia* zone of the standard early Late Cambrian faunal succession (Lochman and Wilson, 1958, p. 333). According to the interpretation presented here, the Nolichucky and Conasauga formations of Tennessee and Alabama represent the outer sedimentary belt, and the Maynardville limestone and some of the lower part of the Knox group (of authors) represent the generally eastward regressive movement of the middle carbonate belt over the outer belt. In eastern Nevada and western Utah, the eastward transgressive movement of the outer belt is represented in the Dunderward shale (of Nevada only), the Lincoln Peak formation in eastern Nevada, and thin-bedded limestones, shales, and siltstones in the middle part of the Orr and Hicks formations in western Utah. The Johns Wash limestone in eastern Nevada and limestones in the upper part of the Orr and Hicks formations in western Utah represent westward regressive movement of the middle carbonate belt. The Corset Spring shale in eastern Nevada and the "Dunderberg" shale (of authors) in western Utah represent the maximum westward regression of the inner sedimentary belt.

Refinement of knowledge of the early Late Cambrian faunal succession in eastern Nevada and western Utah shows that the fauna of the "Dunderberg" shale (of authors) in western Utah is partly younger than that of the Dunderberg shale of Nevada. Regional stratigraphic evidence indicates that the two units represent sedimentation from different sources and that they were probably never coextensive.

Sedimentary successions of Early and Middle Cambrian age, later Cambrian age, and Early Ordovician age in western United States can probably also be explained in terms of the three shifting belts of sedimentation. Study of the facies significance of particular kinds of carbonate sediments within the middle carbonate belt presents a challenge with considerable potential for further refinement of Cambrian stratigraphy.

Reference

Lochman, Christina and Wilson, J. L., 1958, Cambrian biostratigraphy in North America; Jour. Paleontology, 32, no. 2, p. 312-350.

DAVID B. DOAN: Some eustatic sea levels of the Western Pacific.

H. A. TOURTELOT, L. G. SCHULTZ, and J. R. GILL: Chemical and mineralogical composition of the Pierre shale in South Dakota and adjacent states.

804th Meeting

The 804th meeting of the Society was held in the John Wesley Powell Auditorium, November 11, 1959, President Joseph W. Greig presiding.

Program—DONALD R. NICHOLS and LYNN A. YEHLE: Mud volcanoes in the Copper River Basin, Alaska.

Two groups of mud volcanoes, consisting largely of clayey silt cones which discharge gas and highly mineralized spring water, occur within 15 miles of Glennallen. The four cones of the Tolsona group range in height from 20 to 60 feet, and lie west of the Copper River near coal-bearing rocks of Tertiary age: three cones are active, discharging methane and nitrogen gas and sodium and calcium chloride water. The three cones in the Drum group are 150 to 300 feet high, lie east of the Copper River near the slopes of the volcanic Wrangell Mountains, and emit carbon dioxide gas and warm sodium chloride and bicarbonate waters.

The gas source of Tolsona springs may be from buried marsh or coal deposits because the springs contain only a trace of carbon dioxide and lack hydrocarbons heavier than methane. Gas from Drum springs probably emanates from volcanic sources. Water in Tolsona springs may be a mixture of meteoric, connate, or highly saline ground water; the Yuma springs may also include small amounts of volcanic water.

Formation of the cones was by quiet intermittent accretion and, in the Drum cones, probably included eruptive phases. Most of the cones formed largely before or during the last major glaciation.

ALICE D. WEEKS: The role of diagenesis of sandstone-type uranium deposits.

GORDON G. LILL: The Moho deep drilling project.

805th Meeting

The 805th meeting of the Society was held in the John Wesley Powell Auditorium, December 9, 1959, Vice-President C. A. Anderson presiding.

Program — The Presidential address; JOSEPH W. GREIG: Development of phase equilibrium studies in the interest of petrology.

67th Annual Meeting

The 67th annual meeting was held immediately following the 805th meeting, President Joseph W. Greig presiding. The reports of the secretaries, treasurer, and auditing committee were read and approved. The Awards Committee presented first prize for the best paper of the year to W. GARY ERNST for his paper "Glaucophane stability and the glaucophane schist problem." Second prize was awarded to JOHN C. REED, JR. and BRUCE H. BRYANT for their paper "Lower Cambrian and Late Precambrian rocks in the Grandfather Mountain window, North Carolina." Three honorable mention awards were given to: R. S. SIGAFOOS for his most enjoyable talk on "Botanical evidence of floods and flood-plan deposition"; E. S. SIMPSON for his controversial "A ground water mechanism for the deposition of glacial till"; and EMILY JAGER for her paper "Age measurements on some Alpine and pre-Alpine micas." The Sleeping Bear Cup was presented to HENRY FAUL, a consistent critic of geologists, over the years.

Officers for the year 1960 were then elected:

President: HARRY S. LADD
First Vice-President: LUNA B. LEOPOLD
Second Vice-President: WALTER S. WHITE
Secretary (2 Years): JOHN T. HACK
Treasurer: MARGARET COOPER
Members-at-Large of the Council (2 years): PHILIP H. ABELSON, DEAN S. CARDER, and S. WARREN HOBBS.

The Society nominated CARLE H. DANE to be a Vice-President of the Washington Academy of Sciences for the year 1960.

Science in Washington

SCIENTISTS IN THE NEWS

This column will present brief items concerning the activities of members of the Academy. Such items may include notices of talks given, important conferences or visits, promotions, awards, election to membership or office in scientific and technical societies, appointment to technical committees, civic activities, and marriages, births, and other family news. Formal contributors are being assigned for the systematic collection of news at institutions employing considerable numbers of Academy members (see list on masthead). However, for the bulk of the membership, we must rely on individuals to send us news concerning themselves, and their friends. Contributions may be addressed to **Dr. Harold T. Cook, U.S.D.A., Washington 25, D.C.**

APPLIED PHYSICS LABORATORY

Ralph E. Gibson presented a talk, "A Systems Approach to Research Management," at the Naval Research Reserve Seminar on Research Planning and Management, held August 25 at Princeton University.

Alfred J. Zmuda published a paper, "Ionosphere Electrostatic Fields and the Equatorial Electrojet," in the August issue of the *Journal of Geophysical Research*.

CATHOLIC UNIVERSITY

Karl F. Herzfeld, head of the Physics Department, will be awarded the Gibbons Medal by the University Alumni Association at its annual meeting in November. This medal is presented annually for outstanding contributions to the United States of America, the Catholic Church, or Catholic University.

Dr. Herzfeld attended the 8th Annual Symposium on Combustion, held at Pasadena, Calif., August 28 to September 2.

George D. Rock, professor of physics, has be named secretary-general of the University.

William S. Osgood, who recently retired from Renssalaer Polytech with the title of professor emeritus, has been appointed professor of civil engineering.

W. Gardner Lynn, head of the Biology Department, presented a paper, "Types of Amphibian Metamorphosis," at the American Society of Zoologists' Refresher Course on Metamorphosis at Stillwater, Okla., August 29. Professor Lynn also attended the 10th International Congress for Cell Biology in Paris, September 4-9, and the Symposium of the International Institute of Embryology at Pallanza, Italy, September 15-20. While abroad he visited the biological laboratories of the University of Milan, the Oceanographic Institute in Paris, Louvain University, the University of Stockholm, and Bedford College, University of London.

GEOLOGICAL SURVEY

Waldemar T. Schaller presented a paper, "Some Ideas on Beryl," before the Mineralogical Society of Great Britain and Ireland on June 2. He also attended sessions of the 21st International Geological Congress, held in Copenhagen August 14-25. During the summer, Dr. Schaller traveled in various other European countries, visiting fellow scientists and points of scientific interest.

During the summer, **Clarence S. Ross** attended meetings of the International Geological Congress in Copenhagen, served as delegate to a conference of the International Mineralogical Association, and participated in a field trip around North Cape, Norway. While in Europe, Dr. Ross visited several other countries before returning to Washington on September 20, his 80th birthday.

Thomas P. Thayer gave a paper at the International Geological Congress in Copenhagen on "Some Critical Differences between Alpine and Stratiform Ultramafic Complexes." In September Dr. Thayer examined ultramafic complexes in Yugoslavia and Turkey, and attended a conference on chromite in Ankara, September 26-October 5, for the International Cooperation Administration.

Edwin W. Roedder attended meetings of the International Geological Congress in Copenhagen and gave a paper on "Fluid Inclusions as Samples of Ore-forming Fluids." Dr. Roedder and his family also toured a number of Scandinavian and other European countries before returning to Washington.

George T. Faust attended sessions of the International Union of Geodesy and Geophysics at Helsinski, Finland, July 24 to 27, and of the International Mineralogical Association and International Geologic Congress in Copenhagen. Dr. Faust served as secretary *pro tem* of the Mineral Data Commission of the IMA and was elected secretary for 1961-62. Between the meetings in Helsinski and Copenhagen he made several field trips in Norway, and after the meetings in Copenhagen he did field work in West Germany and Alsace before returning to Washington.

Jewell J. Glass participated in field trips in Norway and Sweden and attended sessions in Copenhagen of the International Geological Congress. After the Congress she visited West Germany.

Martha S. Carr and **Walter B. Lang** were married July 21. Both retired on July 31, having been in the Geological Survey since 1918 and 1922, respectively. Since their marriage, Mr. and Mrs. Lang have been traveling in England and Europe; they attended meetings of the International Geological Congress in Copenhagen during August.

Irving May has been appointed a member of the Division of Chemistry and Chemical Technology of NAS-NRC, to serve as liaison representative on behalf of the Geological Survey.

Raymond L. Nace received the Ph.D. degree (geology) from Columbia University on June 6.

HOWARD UNIVERSITY

The year 1960 has brought three distinct honors to **Moddie D. Taylor,** professor of chemistry. In June, he was selected as one of six winners of the Manufacturing Chemists' Association's Chemistry Teacher Awards. Each award consists of a medal, a citation, and $1,000, given for outstanding undergraduate teaching. Francis O. Rice of the Georgetown University Chemistry Department also was a winner of a 1960 MCA award.

Dr. Taylor also was one of a group of five well-known scientists selected by the Robert A. Welch Foundation to participate in its Visiting Scholar Program. Dr. Taylor will spend the academic year 1960-61 conducting personal re-

search on rare earth compounds at Prairie View (Tex.) A&M College. The other four participants are Edward Teller, who will visit at Rice University; Hans Jonassen of Tulane, who will visit at the University of Texas; W. B. Smith of Ohio State University, who will visit at Texas Christian; and Daniel Bovet, Nobel laureate in chemistry from the University of Rome, who will visit at Southwestern Medical School in Dallas.

Also, Dr. Taylor's book, "First Principles of Chemistry," was published this year by D. Van Nostrand. It has already been adopted by 25 schools throughout the country and promises to become one of the more rigorous general chemistry texts on the market.

Dr. Taylor has been on the faculty at Howard University since 1948, and is very active in chemical education at the college and high school level. His research has included work on the hydrogen bond of dimeric carboxylic acids, and on the physical properties of rare-earth halides and benzoates.

NATIONAL BUREAU OF STANDARDS

Allen V. Astin, director of the Bureau, was one of 35 new members recently elected to the National Academy of Sciences.

William D. Appel, former chief of the Textiles Section before his retirement received an honorary doctor of science degree from North Carolina State College at its May commencement.

William N. Harrison, chief of the Enameled Metals Section, was one of 19 persons to receive the 1960 Award of Merit of the American Society for Testing Materials, in recognition of distinguished service to the Society. He received a certificate at the ASTM June meeting in Atlantic City.

Archibald T. McPherson, associate director, received the 1960 Honor Award of the Washington Chapter, American Institute of Chemists, at a dinner on May 24. Dr. McPherson was cited for "unselfish devotion to the encouragement of young scientists, and interdisciplinary contributions in the national interest through his imaginative leadership in calibration and specification activities."

Lauriston S. Taylor, chief of the Radiation Physics Division, received an honorary doctorate of science from the University of Pennsylvania on June 15.

William W. Walton has been appointed chief of the Floor, Roof, and Wall Coverings Section of the Building Technology Division. **Kurt E. Shuler,** formerly consultant to the Heat Division, has been appointed consultant to the director.

Several Academy members have retired from the staff in recent months, as follows: **Garbis H. Keulegan,** physicist in the Fluid Mechanics Section, on July 31; **Fred L. Mohler,** chief of the Mass Spectrometry Section, on July 15; **Hubert R. Snoke,** assistant chief of the Building Technology Division, on July 31; and **Harold F. Stimson,** senior physicist in the Temperature Physics Section, on April 30 after more than 42 years at the Bureau.

Academy members presenting papers at recent international meetings have included the following: **Norman Bekkedahl,** "Research Work in the Polymer Structure Section of the National Bureau of Standards," at the Institut Argentino Elastomeres, Buenos Aires, September 21; **Francis C. Breckenridge,** "A Correlation of Signal Color Recognition Tests," at the 6th International Technical Conference on Lighthouses and Other Aids to Navigation, Washington, September 26-30; **Herbert P. Broida,** "Electronically Excited CN Produced by Reactions of Atomic Nitrogen with Hydrocarbons: Pressure Dependence of Rotationally Perturbed Lines in the Ultraviolet Band Spectrum of CN," at the Symposium on Atomic Reactions, McGill University, Montreal, September 7; **H. P. R. Frederiske,** "Properties of Turile (TiO_2)," at the IUPAC Conference of Semiconductors, Prague, August 29-September 2; **Gordon M. Kline,** "Absorption of Polyesters and Other Polymers to Glass and Other Substrates," at the IUPAC Division of Plastics and High Polymers Symposium on Reinforced Polyester Resins, Turin, Italy, September 28; **Ladislaus Marton,** "Characteristic Energy Losses of Electrons," before the Czechoslovakian Academy of Sciences, Prague, in August; and **Charlotte M. Sitterly,** "Report on Atomic Spectra," before the Triple Union Commission on Spectroscopy, Ottawa, September 5.

NATIONAL INSTITUTES OF HEALTH

Chester W. Emmons, head of the Medical Mycology Section, National Institute of Allergy and Infectious Diseases, gave his presidential address before the Mycological Society of America at its recent meeting in Stillwater, Okla. "Mycologists must continue," he stated, "to take increasing responsibility in the study of the fungi" which cause systemic mycoses. Emphasizing the importance of work in this field, Dr. Emmons noted that in one recent year mycotic deaths in the United States equalled the number of poliomyelitis deaths and exceeded by one the total number of deaths reported for whooping cough, diphtheria, scarlet fever, typhoid, malaria, and brucellosis.

Sarah S. Stewart, of the National Cancer Institute, and **Bernice E. Eddy,** Division of Biologics Standards, have reported that the resistance of mice to tumor induction by the SE polyoma virus has been traced to the presence of antibodies in serum and milk of the mothers. Their paper, of which Marjean Irwin and Stephanie Lee are co-authors, appeared in a recent issue of *Nature*.

Nathan B. Eddy, principal pharmacologist at NIH since 1939, and the foremost world figure in the field of drug addiction and analgesics, re-

tired September 1 at the mandatory age of 70. Dr. Eddy announced that he planned to make few changes in his regular schedule of scientific activities.

NAVAL ORDNANCE LABORATORY

Hermann H. Kurzweg has left NOL to become assistant director of research at the National Aeronautics and Space Administration. He has been succeeded as associate technical director for aeroballistics by **Robert E. Wilson,** who for the past three years had been chief of the Laboratory's Aeroballistics Program.

USDA, BELTSVILLE

Clarence H. Hoffmann, assistant director of the Entomology Research Division, gave a lecture, "Approaches to Biological Control by the Entomology Research Division of the U.S. Department of Agriculture," at the recent 11th International Congress of Entomology in Vienna; he was an official delegate of the Entomological Society of America. While abroad, Dr. Hoffmann visited a number of scientific laboratories, educational institutions, and chemical companies.

Dr. Hoffmann also presented a paper, "Effects of Insecticides on Aquatic Life," at a Conference on Physiological Aspects of Water Quality, held in Washington under the auspices of the Public Health Service.

USDA, WASHINGTON

Robert W. Webb received a high public tribute from Senator John S. Cooper (R. Ky.) in the September 2 issue of the *Congressional Record Appendix.* Senator Cooper called attention to Dr. Webb's pioneering research on the nature and properties of cotton fiber, and stated that it had completely changed the concepts of cotton quality in production, marketing, and utilization. He inserted an article in the *Record* entitled, "He Pioneered a New Science that Changed the Ways of a Great Industry," that described Dr. Webb's work.

Hazel K. Stiebeling, director of the Institute of Home Economics, was a member of the organizing committee of the Fifth International Congress on Nutrition, held here September 1-7. She served as co-chairman of one of the sessions and reported on original research.

Joseph R. Spies presented a paper, "The Chemistry of Allergens XV. Inactivation of the Castor Bean Allergen and Ricin by Heating with Aqueous Calcium Hydroxide," before the Biological Chemistry Division of the American Chemical Society, meeting in New York on September 12. **E. Jack Coulson, Harry S. Bernton,** and **Henry Stevens** were co-authors.

Elbert L. Little, Jr., dendrologist of the Forest Service, represented the United States in the FAO Latin American Conifer Seminar and Study Tour, held in Mexico September 19 to October 28.

UNIVERSITY OF MARYLAND

In the Institute for Molecular Physics, **Edward A. Mason** and **Homer W. Schamp, Jr.,** have been promoted from associate professor to professor.

UNCLASSIFIED

Ellsworth P. Killip, retired, has described 11 new species of the passion-flower family in a recent Smithsonian Institution publication. Dr. Killip, who has had a lifelong interest in the passion-flower, some years ago listed the 365 species then known in America. He discovered the new varieties during explorations in Colombia and Venezuela.

Samuel B. Detwiler, retired, spoke on "Trees, Forests, and Water" before the science class of Gunston Junior High School, Arlington, on September 14. This was the first lecture to be given in the current scholastic year under the visiting scientists and engineers program sponsored by the Joint Board on Science Education.

DEATHS

Frank C. Kracek died July 5 at the age of 69. He received his doctorate in physical chemistry from the University of Minnesota in 1924, and 33 years was a physical chemist associated with the Geophysical Laboratory of the Carnegie Institution; his principal researches at the Geophysical Laboratory were in the field of phase equilibrium studies of the alkali silicates, sodium sulfate, and the silver sulfides and tellurides. More recently, his research was in the field of mineral thermochemistry, in particular determining heats of formation of the feldspar minerals and alkali silicates. In 1956, upon retirement from the Geophysical Laboratory, he became associated with the Geological Survey, continuing his work on the thermochemistry of rock-forming minerals.

AFFILIATED SOCIETIES

Experience during the first several months of the current year indicates that the *Journal* will better serve the Academy members if it reports the activities of the affiliated societies in two separate ways. We shall, as occasion permits, gradually shift our format in this direction, and hope to have the change fully accomplished in time for the January, 1961, issue. One facet of this proposed arrangement will be a "Calendar of Events," to include only those programs which will be held after the scheduled (and, we hope, actual) appearance of the *Journal.* This calendar will be listed by date, rather than by organization, and will restrict itself essentially to title and a minimum of other essential data. A second feature of the projected reporting system will be devoted to the activities of the societies, special projects, executive committee actions, educational activities and any other newsworthy material. Up to now we have signally failed to get a representative amount of this kind of thing, yet we are

convinced that it would be interesting as well as valuable if we had it. Our decision to separate the calendar of events from the news items is largely prompted by the hope that more time will thus be freed for gathering the latter. Finally, we hope to publish, at least once each year, a complete listing of the affiliated societies, including the incumbent officers, the place and time of regular meetings, scheduled election dates, and so on.

For this and the December issue, the prevailing format will be retained in reporting the activities of the affiliated societies.

Acoustical Society of America, Washington D.C. Chapter

On 19 September, Mr. M. K. Bull, Department of Aeronautics and Astronautics, University of Southampton, spoke on boundary layer work, particularly as it concerns measurement of pressure fluctuations on the walls of wind tunnels and water tunnels.

The October 17 program featured R. K. Cook and J. M. Young, National Bureau of Standards, dealing with "Strange sounds in the atmosphere."

American Institute of Electrical Engineers, Washington Section

A panel meeting on "Planning the structure of the engineering profession for unity", providing an opportunity for participation by members of the section, and looking to a vote on certain alternative plans, was held on October 11. Ample evidence of the need for facing the problem of unified action is indicated by the fact that there are now well over one hundred different engineering organizations in the U. S.

American Society for Metals, Washington Chapter

On November 14, John A. Bennett, Chief Metallurgy Section, National Bureau of Standards, will speak on "What the metallurgist is doing about fatigue."

American Society of Civil Engineers, National Capital Section

At the September 13 meeting, Mr. Erskine Stewart, Acting Director, Better Highways Information Foundation, spoke on the role of his organization. The following month, October 11, Mr. O. A. Schmidt, who is World Bank director of operations for the Western hemisphere, described the program of the organization in general and discussed some specific projects in Latin America.

The section is arranging to hold joint meetings with various student chapters in the Washington area; the first, on October 5, was at the George Washington University.

Two prizes, one for associate members and one for student members, are to be awarded for papers on the place of professional ethics in the engineering curriculum, and on ethics in the legal, medical, and engineering professions respectively. Candidate papers are to be given before sectional or student chapter meetings, and the best entered in a final competition for the Daniel W. Mead award.

American Society of Mechanical Engineers, Washington Section

September meetings included a discussion on September 8 of the "Utilization of outstanding rubbers and plastics" by G. W. Flanigan of the B. F. Goodrich Chemical Co., and on September 22 a talk by Dr. A. G. Norem, Institute of Defense Analyses, on "Engineering aspects of aerodynamic heating."

On October 13, R. E. Fischell and M. A. Schreiber, both of the Johns Hopkins Applied Physics Laboratory, described the design and use of the Transit satellite, supplementing their remarks with a sound color film. Two papers were presented on October 27: (1) Jeffrey Watkins, of the Solar Aircraft Company, on "Design and development of an advanced high performance gas turbine engine," the 1100 HP Saturn; and (2) J. J. Pippenger, Double A Products Company, Michigan, on "Fluid power controls," including comment on the modification of industrial equipment for ground support.

Botanical Society of Washington

At the first meeting of the current season, C. B. Davey and George Papavizas, of the Plant Industry Station, Beltsville, jointly summarized their research of the past three years on the "Biological control of soil pathogens," particularly as it relates to root rot fungi.

Chemical Society of Washington

Two concurrent sessions were held, following dinner, on October 13, at Catholic University: (1) P. J. Elving, University of Michigan, on "Mechanisms of organic electrode reactions," and (2) a panel discussion, moderated by Frederick Nachod, Sterling-Winthrop Research Institute, on "Improving the professional stature of chemists and chemical engineers."

In addition to the election of officers, the November 10 meeting included a talk by Stephen Brunauer, Portland Cement Association Laboratories, on the "Hydration of the calcium silicates."

Arthur Cope MIT, and president-elect of the ACS, is scheduled to address the society at its December 1 meeting in Hurst Hall, American University, on the subject "Unusual transannular reactions." There will be a dinner in Mary Graydon Hall preceding the program.

Columbia Historical Society

The society's first meeting of the season, October 18, featured presentation by Donald

Mugridge of a "Photographic record of Washington during the Civil War," and by Richard Mansfield on "Washington as Dick Mansfield knows it."

Recent gifts to the organization include: several hundred old lantern slides from the collection of the late Dr. Laurence Schmeckebier, covering more than fifty years; bound volumes of clippings from various sources; material on the history of the Marine Band, and a large collection of first edition Sousa marches; a gavel made from wood recovered in the 1927 repair of the White House roof; and several inauguration programs of historical interest and value.

Helminthological Society of Washington

An all-day program of scientific programs, culminating with a banquet, was held on October 8, at the University of Maryland in commemorating the fiftieth anniversary of the founding of the Society. Formal papers on perspectives in parasitology, on dietary factors affecting ovarial transmission of symbiotes, on physiology of intracellular parasites, and on goals for parasitologists, in the morning, were followed by afternoon informal discussions organized about six "interest groups." The banquet speaker was Dr. C. D. Leake, whose address was entitled "Paralouge and Parasite."

Insecticide Society of Washington

Four papers, all directed to the problem of the face fly in livestock, made up the October 19 meeting. The material was presented by scientists from the Entomology Research Division of the USDA and from the Department of Entomology of the University of Maryland.

Institute of Radio Engineers, Washington D.C. Section

Phil Allen, of the Naval Research Laboratory, who has been long concerned with satellite tracking techniques, spoke on October 10 of the "Monopulse system—a precision tracking radar." The emphasis was laid on new microwave techniques and components.

A series of lectures, at two-week intervals until December 6, is offered jointly by the Professional Groups on Microwave Theory and Technics and on Antennas and Propagation, on the general topic "Antenna theory and techniques." Selected lecturers will be featured, and the sessions held, beginning October 11, in the East Building of the National Bureau of Standards.

Medical Society of the District of Columbia

A considerable array of programs of interest to medical personnel in the Washington area were noted in the October issue of *Current Medical Events*. Among these were: October 6 symposium organized by the Committee on Public Information and Education for the doctors' office staff; a forum on "General problems in medical practice" held October 29 arranged by the Medical Council of the Washington Metropolitan Area; and a series of postgraduate lectures on the basic sciences, weekly from October 5 to November 15, in the auditorium of the Medical Society Building at 1718 M Street, N.W.

Philosophical Society of Washington

A special *Fifteen Hundreth* meeting of the society is scheduled for December 2!

ACADEMY ACTIVITIES

Board of Managers, June Meeting

These notes are intended to outline briefly, for the information of the membership, the principal actions taken at Board meetings. They are not the official Minutes as prepared by the Secretary. —Ed.

The Board of Managers held its 530th meeting on June 21 at NBS, with President Wood presiding. The Minutes of the 529th meeting were approved as previously circulated, with minor corrections.

Dr. Wood announced appointments to the 1960 Committee on Awards for Scientific Achievement, as follows: General chairman, Archie I. Mahan; panel chairmen, W. Gardner Lynn (biological sciences), Charles Herzfeld (engineering sciences), Francis E. Johnston (mathematical sciences), Norman Bekkedahl (physical sciences), and Ralph B. Kennard (teaching of science). Dr. Wood also indicated that the membership of the panels would be established by agreement between the general chairman and each panel chairman.

Chairman Hall of the Membership Committee presented, for first reading, the names of 14 candidates for membership.

In the absence of Chairman McPherson of the Policy and Planning Committee, Arnold M. Sookne stated that the Committee has met to consider means for improving relations between the Academy and its affiliated societies. The Committee plans to meet with society officers to check the amount of interest in the Academy, and in particular to determine the present number of society members who are also members of the Academy; also, it hopes to prepare some literature on the Academy's objectives and activities for the information of scientists of the metropolitan area. Further, it is examining the feasibility of issuing a joint directory of the Academy and affiliated societies, along the lines of the one that appeared in 1948. The Committee felt that the voting privileges of representatives of affiliated societies at WAS Board of Managers meetings should not be curtailed.

Dr. Hall presented for second reading the names of 11 candidates previously proposed for Academy membership, as follows: Morris K. Barrett, Morris Belkin, Robert W. Berliner, William R. Carroll, Margaret K. Derringer (Mrs. Morris K. Barrett), George W. Howard, George

B. Mider, David P. Rall, Joseph L. Stearn, Paul DeL. Thomas, and Charles G. Zubrod. These candidates were thereupon elected to membership.

The secretary reported the following figures on Academy membership: Resident active, 765; resident retired, 61; nonresident active, 184; nonresident retired, 60; total, 1070.

The treasurer reported that for the period January 1 to June 21, receipts were $13,526 and disbursements were $12,066.

Board of Managers, October Meeting

The Board of Managers held its 531st meeting on October 18 at NBS, with Secretary Specht presiding in the absence of the President and President-Elect.

The minutes of the 530th meeting were approved with minor corrections.

In the absence of Chairman Stiehler of the Meetings Committee Dr. Specht announced the next three meetings as follows:

October 20. Dr. S. L. Madorsky. Impressions of a recent trip to Russia.

November 17. Professor E. Bright Wilson, Jr. An introduction to scientific research. A joint meeting with the Junior Academy and the D. C. Chapter of Sigma Xi.

December 15. Dr. Harry Wexler. Weather satellites.

Commenting on these talks, A. T. McPherson pointed out that Dr. Madorsky, having been born in Russia, can speak the language and has taken advantage of his opportunity to talk to the people; that Professor Wilson has written a book on his subject; and that Dr. Wexler's satellites are completely revolutionizing the forecasting of weather.

In the absence of Chairman Hall of the Membership Committee, Howard H. Campaigne presented, for first reading, the names and citations of 21 candidates for membership.

For the Committee on Grant-in-Aid, Dr. Specht reported $916.22 available for grants.

Chairman McPherson of the Policy and Planning Committee reported that his committee is making a systematic attempt to obtain from the affiliated societies suggestions for strengthening the bonds between them and the Academy. He thanked Gerhard Brauer for a report on this subject from the Washington Section of the International Association for Dental Research.

For the Committee on Science Talent, Dr. Specht reported success of a summer program for providing scientific working experiences for selected high school students. The Academy contributed toward pin money for the students' lunch and car fare.

For the Joint Board and the Committee on Science Education, Dr. Specht passed around for inspection John K. Taylor's report of July 15 to the National Science Foundation on the activities of the Academy's 1959-60 science education program that had been supported by the Foundation.

Dr. Campaigne presented for second reading the names of 14 candidates proposed last June. They were elected and will be invited to accept membership in the Academy. Their names and affiliations are listed at the end of this report.

Dr. Specht reported the following figures on Academy membership: Resident active, 778; resident retired, 62; non-resident active, 177; non-resident retired, 63; honorary, 6; total, 1086.

Treasurer Aslakson reported that as of September 30 receipts were $11,599; disbursements, $12,302.

Chairman Shepard of the Special Committee on By-Laws handed to Dr. McPherson a draft of a revision of the Standing Rules of the Academy for consideration by the latter's Committee on Policy and Planning. Dr. Shepard's committee was then discharged with the thanks of the Board.

Present by invitation of President Wood to report this meeting for the *Journal of the Washington Academy of Sciences*, Past President Campbell gave the Board an informal report of plans of the editorial group for the 1961 *Journal* and allocation of responsibility for its production.

Mrs. R. R. Fell, the Academy's staff officer, suggested that a member wishing to resign in good standing before the end of a calendar year be permitted to pay partial dues for his last year, covering the period from January 1 to the date of his resignation. No action could be taken immediately on this proposal.

The meeting adjourned at 9:15. Dr. Specht requested the Vice-Presidents representing the Affiliated Societies to remain for a special meeting to nominate officers of the Academy for 1961.

Elected to Academy Membership

John I. Bohnert, Naval Research Lab.
Rollon O. Bondelid, Naval Research Lab.
Bernard B. Brodie, Nat. Heart Institute
Harvey R. Chaplin, Jr., David Taylor Model Basin
Kenneth L. Dunning, Naval Research Lab.
Alan C. Kolb, Naval Research Lab.
Cornell H. Mayer, Naval Research Lab.
Edward F. McClain, Jr., Naval Research Lab.
Leonard M. Murphy, Coast and Geod. Survey
Bruce M. Pollock, Plant Industry Station
Milton S. Schechter, Agr. Res. Center
Allen H. Schooley, Naval Research Lab.
Robert F. Steiner, Naval Med. Res. Institute
Eligius A. Wolicki, Naval Research Lab.

THE BROWNSTONE TOWER

FRANK L. CAMPBELL

One would think that all readily understandable improvements in ordinary devices that make our lives easier would have been invented long ago and that all modern improvements might be confined to sophisticated applications of mathematical physics and chemistry, the kind of wizardry that old-timers who failed to keep up to date cannot now understand. Actually, inventors are as busy as they ever were and are turning out devices that are so effective and so simple that we exclaim, "Why didn't *I* think of it!"

The first Washington inventor we ever heard of was the late husband of our Aunt Mary. He had invented (nowadays we say "formulated") a potent mixture that our aunt firmly believed to be a panacea. Before the days of the Food and Drug Administration there was nothing to prevent Aunt Mary from proclaiming the virtues of "Johnson's Painkiller" without restraint and from making it in Washington and trying to sell it in Philadelphia. It was probably harmless, for she used it and lived to an overripe old age.

This early experience did not cause us to concoct a better panacea. We just didn't have the practical inventive urge, but we have always been interested in the achievements of those who are often called gadgeteers. Why this term should be not quite respectable, is a mystery to us. Is a happy turn of phrase more worthy than a better mouse trap? We think not. We believe that the imagination, knowledge, and skill required to build a better mouse trap are quite as rare and more valuable than the art of putting words together in a way that should cause a reader to pay attention. Indeed, we would glorify the mouse trap builder, and consign to perdition those advertisers who for a price imply that Sylvan Cigarettes are the breath of romance or that Belch Beer and beauty are synonymous.

As a boy our best friend was a gadgeteer, and we encouraged, applauded, and sometimes financed his creative adventures, which culminated in the building of an automotive vehicle. In between our catalytic activities in gadgeteering, we read Le Comte de Monte Cristo and other impractical creations of Alexandre Dumas, père.

We did not encounter inventive genius again until many years later here in Washington. Then we had the privilege of knowing Dr. Lyle D. Goodhue, a member of the staff of the Division of Insecticide Investigations of the old Bureau of Entomology, U. S. Department of Agriculture. It happened that we worked in the same building at the Agricultural Research Center in Beltsville. Lyle realized that the effectiveness of a liquid or solid insecticide depended not only on its chemical composition but on the size of particles brought into contact with the insect. A priori it seemed that the effect would be proportional to the degree of dispersion of the insecticide, the smaller the particles the greater the effect for a given weight of material. Therefore he became interested in the production of insecticidal smokes, or, as he called them, aerosols, a term then current in colloid chemistry. He made a systematic study of ways and means for producing such smokes, for example, by impinging a fine stream of insecticide on a hot plate, or by burning a flammable mixture containing a stable insecticide.

One day in 1935 it occurred to Lyle that it would be possible to produce a useful aerosol by dissolving an insecticide in an inert volatile liquid that could be sprayed out of a container by the pressure of its own vapor. He asked us to witness this idea in his notebook. This we did by initialing his description of it. Thus we were present at the birth of one of the most lucrative ideas that was ever gestated by a Washington scientist. It was later the subject of a Public Service Patent that was the beginning of a billion dollar industry, not only for the convenient dissemination of insecticides, but for the pushbutton application of a hundred other products including paint, perfume, and shaving lather.

In the beginning Lyle was not trying to create a general labor-saving device, but merely to produce satisfactory insecticide aerosols. Thus his work may be called basic to the tremendous practical deviopments that followed. He was successful because of his thorough grounding in physical and chemical principles, methods, and materials, his ability to do his own shop work, and his lively curiosity about current scientific developments. Looking back, one can identify the key that opened the door for Lyle; it was his knowledge of the physical and chemical characteristics of Freon, a fluorinated hydrocarbon then, and still, used as a refrigerant, that caused him to select it as a safe solvent and propellant for his insecticide. After that it was just a matter of working out mechanical details and of testing and promoting the resulting "aerosol bombs," which were used to protect our soldiers in World War II. The testing and promotion were well done by our former assistant. William N. Sullivan.

Did Lyle Goodhue become a millionaire? No, he did not even become prosperous as a result of his flash of genius, but he did benefit by it. He became Director of Research in Agricultural Chemicals for the Phillips Petroleum Company

in Bartlesville, Oklahoma, and has raised his family there in a very pleasant environment. Although seriously handicapped by defective vision throughout his life, Lyle has always been an unusually happy person with a penetrating sense of humor. His job now is to find agricultural uses for chemicals that Phillips can produce. So far he has not hit a jack pot remotely approaching the potential of the push-button propellant but he still has the pleasure of the search from which products now unimagined may arise. Currently he is investigating the action of certain chemicals on pest birds, having found one that will temporarily prevent birds from flying. It seems that birds so grounded become frustrated and when they are able to fly away they do not return to the scene of their discomfiture. We look forward to the destarlingization of Washington by this method.

When Lyle is not working for Phillips, he is usually to be found at home, working in the greenhouse that he built himself for the production of exotic house plants. He has made the interior of his greenhouse a thing of beauty and a source of some additional income. By any reasonable standards he is a very successful man.

We cannot close this little excursion into inventive genius without calling attention to an invention of our own, which we think reduces the daily business of shaving to the lowest common denominator. And Lyle Goodhue was responsible for it. We had been using one of his pressurized lather cans while on a trip that enabled us to visit him in Bartlesville. At the Tulsa Airport we opened our bag and found everything in the central compartment buried in lather. Something in the bag had pressed against the valve of the can and released all the lather in it! From that moment we resolved never to use Lyle's lather dispenser again. Then we quickly found by trial of various cakes of soap that some produce suds more readily and abundantly than others. Furthermore, we found that it is not necessary to use a brush or soap container for the purpose of whipping up and applying a lather; one simply washes his face and hands with the right kind of soap and then continues the motions of hand washing without rinsing until the foam, originally in large bubbles, has been reduced to a creamy persistent lather. Then by using one hand as a squeegee on the other the lather is collected into a large blob on the fingers of one hand, by which it is applied to the face as one would apply a blob from a pressure can. Thus materials for shaving are reduced to a razor and cake of soap, the hands and face are washed at the same time (not a necessary accompaniment of the use of an electric razor), and cost is minimized. As an inventor we now bow out.

JOINT BOARD

Gravatt Coleman, General Engineer with the C & P Telephone Co., is the new Executive Secretary, Science Projects, for the Joint Board on Science Education. He replaces Dr. William T. Read who was unable to continue due to other commitments. Mr. Coleman will be responsible for many details of the science project program of which Dr. John K. Taylor is Director.

A Virginian by birth and education, Mr. Coleman had two engineering degrees from Virginia Polytechnic Institute at the age of 21. He was a 1st Lieut., Machine Gun, in World War I. Grav has been with the TELCO Engineering Dept. since 1923 and retires in Feb. '61, when he will devote even more time to JBSE work. The TELCO should be given a vote of thanks for permitting him, in the meantime, to engage in this very excellent public relations job.

He has been active in the Washington Section of the AIEE, having held most of the local committee's chairmanships and elective positions, and a member of one of the National Committees for several years. He helped to establish the Student Branch of the AIEE at Maryland University.

The Washington Society of Engineers will remember him for the banquets he ran for them longer than they will remember his work as a Director of their organization. He has cooperated extensively on the annual Engineers, Scientists and Architects Day celebrations each February.

While with the TELCO, he has determined location for central offices, laid out underground conduit systems for a number of cities in Maryland, Virginia, West Virginia, as well as D. C., prepared cost studies and originated a system of record keeping which has been in use for over 20 years. More recently he has been responsible for engineering contracts with other associated companies and with the Long Lines Department of the A. T. & T. Co., joint ownership of plant used by more than one company, and the engineering decisions on Division of Revenues for toll usage.

Project Ideas for Young Scientists is the title of a new book just published by the Joint Board on Science Education. Some 400 suggestions are given for science projects that should be instructive and stimulate research and investigation by secondary school students.

The book is the outgrowth of several years of collection of ideas for science projects from a large number of leading scientists of the local area. Dr. John K. Taylor, Dr. Phoebe Knipling, and Dr. Falconer Smith edited these contributions and prepared supplemental material which is contained in the 144 page book. Mr. George E. Taylor, science teacher at Wakefield High School assisted in the collection of many of

the suggestions prior to his leaving the area for a year of sabbatical leave to do further graduate work. A copy of the book has been donated to the library of every secondary school of the Washington area.

The book contains a preliminary chapter on general considerations for preparing a science project. Ten chapters follow that deal with the several subject-matter categories of science fairs. All project ideas include references for further information. A chapter entitled Annotated Titles presents some 200 ideas in abstract form and a bibliography that should be especially helpful for background material.

A grant from the Eugene and Agnes E. Meyer Foundation has made it possible to donate the library copies mentioned above and also to permit the sale of the book at a price somewhat below cost. Teachers and students desiring copies may obtain them at $1.25 per copy, postpaid, by writing to the Joint Board on Science Education, 1530 P Street, N.W., Washington 5, D.C. Checks should be made payable to the Joint Board.

Teaching conferences planned for Fall and Winter. As part of the program made possible by a grant from the National Science Foundation, the Joint Board will hold a series of conferences concerned with the teaching of science and mathematics. Patterned after the highly successful series held last year, the conferences will take place during the fall and winter seasons.

As in the past, conferences on the teaching of the senior high school subjects of biology chemistry, mathematics, and physics are being scheduled. In addition, a series of meetings devoted to junior high school general science will be held.

A somewhat different procedure than last year will be followed. A single conference for the entire area will be held for each of the four senior high school subjects. Approximately 100 persons will be invited to attend the all-day sessions and will be the guests of the Joint Board to luncheon. A prominent speaker will address a joint session, after which attendees will be divided into discussion groups to consider problems concerned with subject matter teaching. As formerly, teachers, university instructors, and scientists will participate.

The junior high school conferences, four in number, will be held in as many areas of the local region. Approximately 100 persons from that particular area will be invited to a meeting similar to that described above. Attendees will be selected from junior high school teachers, and scientists.

The first conferences are scheduled for November. One in general science for the Virginia area will be held at St. Agnes Espiscopal school in Alexandria on November 5. Dr. John K. Taylor will serve as chairman of the conference. A conference for the entire area on the teaching of physics will be held at Catholic University on November 19, at which Dr. Raymond J. Seeger will preside.

It is regretted that attendance at these conferences is limited and must be confined to a small group of invitees. Extensive notes will be taken, however, and will be available on request to the office of the Joint Board.

Joint Board supports experimental courses. Is science more meaningful when taught quantitatively with the aid of lots of mathematics? Is arithmetic easier to understand when its application to the solution of laboratory experiments is stressed? The answers to these and many other questions are being sought in eleven experimental classes being conducted by several local school systems with financial assistance from the Joint Board.

The support of experimental teaching programs was a major objective of the Joint Board in its request in 1959 through the Washington Academy of Sciences to the National Science Foundation for a grant. The Foundation approved of the idea and $20,000 was allocated to nine schools to underwrite part of the costs of the experimental classes. Descriptions of the program were carried in the 1959-60 issues of THE REPORTER and are given in more detail in the Summary Report which is available from the Joint Board office.

The 1960-61 grant from the NSF to the Joint Board makes it possible to continue the program. Currently, grants totalling $22,000 have been allotted by the Joint Board for experimental classes in 10 schools. They are summarized as follows:

Beauvoir School will continue to develop a course of study and curriculum materials for a K-3rd grade science program.

Fairfax County will continue an experimental study of the coordination of science and mathematics instruction at the 5th Grade level.

D. C. Schools will continue its experimental classes at the 3rd grade and initiate a new one at the 6th grade level. Both are concerned with applying arithmetic to the study of science.

The excellent experimental classes in elementary education sponsored last year in Montgomery County and also with the Archdiocese of Washington are being continued.

In addition to these, Arlington County also developed an experimental course under Joint Board sponsorship during the 1959-60 school year. They did not request assistance during the current year. It is understood that the course is being continued with county support during the present year, however.

At the junior high school level, grants have been renewed to Arlington County, to the D.C. Schools and to Sidwell Friends School to con-

tinue their excellent experimental programs of last year. In addition, Prince Georges County and Georgetown Day School have been given grants to initiate experimental classes on the coordination of mathematics and science instruction at the junior high school level.

Another newcomer is Osbourn High School at Manassas, Virginia, which is the recipient of a grant to help develop a 12th grade course for accelerated students who have previously had biology, chemistry, and physics. The course will attempt to correlate the science and mathematics already covered into a meaningful fund of knowledge.

SCIENCE AND DEVELOPMENT

The tellurometer, an electronic distance-measuring instrument that eliminated the time-consuming taping method used in surveying, has now gone airborne. Currently being tested by the Army Engineer R&D Labs at Fort Belvoir, the airborne tellurometer is expected to provide a position determination or a distance measurement up to 150 miles with a high degree of accuracy; the range of the ground instrument is 40 miles. In addition, the airborne equipment will not be hampered by line-of-sight restrictions, such as curvature of the earth and mountains, which limit the operation of the ground instrument. It involves the application of ground tellurometer microwave phase comparison ranging techniques to aircraft use.

Geological Survey's "Geologic Map of the United States," first published in 1933, has been reprinted with important color changes that make it easier to read. The 1960 edition is issued in four 27-by-47-inch sheets and sells for $6.00 a set. The scale is 1:2,500,000. Long considered to be a masterpiece of lithographic art, when first issued the map was printed on old-style flat-bed presses from 92 lithographic stones quarried in Germany; each stone weighed 400 to 500 pounds, and lithographing 5,000 copies required 138 working days, or about six months. The 1960 run was printed on presses capable of handling 5,000 sheets an hour, printing two colors simultaneously; instead of the heavy stones, 48 aluminum lithographic press plates were used.

American University was honored on September 12 as the "birthplace of the Army Chemical Corps." A plaque was unveiled on McKinley Hall by Col. C. P. Wood of the First Gas Regiment and accepted by AU President Hurst R. Anderson; principal speaker at the ceremonies was Maj. Gen. Marshall Stubbs, the Army's chief chemical officer. Among those attending was 82-year-old Maj. Gen. Amos Fries, retired, chief of the Gas Service under General Pershing, and first chief chemical officer from 1921 to 1924. The plaque recounts AU's 1917 offer of its campus and buildings for war work, and its occupation by the Bureau of Mines for use as chemical warfare laboratories and proving grounds. In August 1917 the 30th Engineers, later known as the First Gas Regiment, was organized at the University; units of this regiment marched from the campus on Christmas Day, 1917, and sailed for France the next day. In June, 1918, the Chemical Warfare Organization of the Bureau of Mines was transferred to the War Department as a step toward the creation of the Chemical Warfare Service, now the Army Chemical Corps.

In its recent report, "Meteorology on the Move," the NAS-NRC Committee on Atmospheric Sciences notes with satisfaction a number of recent undertakings by government and academic institutions in response to previous Committee recommendations—including a first step toward a National Center for Atmospheric Research—but points out that still further steps are urgently required. Chief among the latter are the rapid development by the National Center of an extensive research and analysis program and the strengthening of the research program of the Weather Bureau. To point up the need for urgency, the report underscores the striking success of the weather satellite TIROS I, man's first instrument for the continuing observation of large-scale weather phenomena. "Analysis of such world-wide meteorological information obtained at regular, short intervals," the report states, "may be expected to increase greatly our understanding of the basic principles of meteorology as well as the precision of forecasting. One may expect that this increased understanding will some day provide the answer to the question whether small- or large-scale weather control is possible."

The first phase of an improved global weather communications network for the regular exchange of weather information on a coordinated basis began operation on October 1, according to Weather Bureau announcement; this involves the activation of weather communication centers at New York, Frankfurt/Offenbach, Moscow, and New Delhi, which will exchange northern hemisphere weather data collected from observation stations within their designated areas of responsibility. A second phase, activation of a Tokyo center in the spring of 1961, will provide for completely coordinated exchange of information for the whole northern hemisphere. A third phase of the program will involve establishment of a similar network in the southern hemisphere, connected with the northern hemisphere network to permit a world-wide exchange. Eventually the network, sponsored by UN's World Meteorological Organization, will consist of an unbroken chain of point-to-point radio teletypewriter and land-line teletypewriter circuits involving the 102 member states and territories represented in WMO.